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13. ABSTRACT *(Maximum 200 words)*

A data repository was established in 1988 to compile information on 1,120 aircrew (74% pilots) who underwent acceleration (+Gz) tolerance training at NAWCAD Patuxent River human-use centrifuge. 51% of the aircrew flew in high performance aircraft (F4, F14, F15, F16, and F18). The trainees were U.S. Navy/Marine Corps (70%) and Air National Guard (30%) aircrew. Balanced data from 817 healthy male trainees were examined. Mean age (+S.D.) was 31.4 $\pm$ 6.8 years (20 to 59). Relaxed tolerance was 4.91 $\pm$ 0.93 +Gz and was shown to be independent of age (R^2 - 0.005). Straining tolerance was 7.17 $\pm$ 1.27 +Gz. Age did not have an effect on straining +Gz tolerance ($R^2 = 0.017$). The protection afforded by the AGSM was 2.72 $\pm$ 0.84 +Gz and was not affected by trainee age ($R^2 = 0.007$). Age did not demonstrate to have an effect on G-LOC incidence. Exposures where cardiovascular data was analyzed (n=19) ranges from 5 to 9 +Gz (5.5 $\pm$ 1.3). The change described by MHR-RHR was 57 $\pm$ 21 bpm. The change described by MHR-RCVHR was 62 $\pm$ 27 bpm. Multiple regress demonstrated that age and the +Gz level at which the MHR occurred (GMHR) explained 55% of the variability in MHR-RCVHR (R^2 age = 0.18, pT_{β_1} = 0.01; R2 GMHR = 0.37, pT_{β_2} = 0.002). The model was described by MHR-RCVHR = 19.03 - 1.40*age + 13.08+GMHR (F= 9.87, p = 0.001). No statistically significant relationship was found based on change in MHR-RHR. The relative long duration GOR exposures are typically used to determine cardiovascular +Gz tolerance in human-use centrifuge studies. Based on the variables examined in this retrospective study, there does not seem to be a significant effect on age on +Gz tolerance.

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HFM SYMPOSIUM
On
"Operational Issues of Aging Crew Members"

THE EFFECT OF AIRCREW AGE ON +Gz TOLERANCE AS MEASURED IN A HUMAN-USE CENTRIFUGE

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INTRODUCTION. A data repository was established in 1988 to compile information on 1,120 aircrew (74% pilots) who underwent acceleration (+Gz) tolerance training at the Naval Air Warfare Center Aircraft Division human-use centrifuge. 51% of the aircrew flew in high performance aircraft (F4, F14, F15, F16, and F18). The trainees were US Navy/Marine Corps (70%) and Air National Guard (30%) aircrew. **METHOD**. The database was examined to determine the effect of age on +Gz tolerance as measured during gradual onset rate (GOR) exposures. GOR were the first in a series of +Gz exposures during a single training day. GOR commenced at a resting level of 1.0 +Gz. +Gz then increased at 0.1 G/s until the trainee experienced 60° Peripheral Light Loss (PLL1) as defined by the inability to see an array of LEDs placed in an arc describing 15° increments (150° total) 30 cm in front of the trainee at eye level. Once PLL1 was reached, trainees performed Anti-G Straining Maneuvers (AGSM) until 60° PLL was reached again (PLL2). Trainees then terminated the +Gz exposure by pressing a button located on a control stick. The limit of the exposures was 9 +Gz. The variables selected for analysis were: trainee relaxed +Gz tolerance (+Gz load at PLL1); trainee straining tolerance (+Gz load at PLL2); and the protection afforded by the AGSM (PLL2-PLL1). Incidence of G-induced Loss of Consciousness (G-LOC) with respect to age was also examined. Resting (RHR), maximum (MHR), and recovery heart rate (RCVHR) available from 19 subjects was also examined to determine the effect of age on baroreceptor response to +Gz and recovery to resting levels.

RESULTS. Balanced data from 817 healthy male trainees were examined. Mean age (± S.D.) was 31.4 ± 6.8 years (20 to 59). Relaxed tolerance was 4.91 ± 0.93 +Gz and was shown to be independent of age (R^2= 0.005). Straining tolerance was 7.17 ± 1.27 +Gz. Age did not have an effect on straining +Gz tolerance (R^2= 0.017). The protection afforded by the AGSM was 2.72 ± 0.84 +Gz and was not affected by trainee age (R^2= 0.007). Age did not demonstrate to have an effect on G-LOC incidence. Exposures where cardiovascular data was analyzed (n= 19) ranged from 5 to 9 +Gz (5.5 ± 1.3). The change described by MHR-RHR was 57 ± 21 bpm. The change described by MHR-RCVHR was 62 ± 27 bpm. Multiple regression demonstrated that age and the +Gz level at which the MHR occurred (GMHR) explained 55% percent of the variability in MHR-RCVHR (R^2 age = 0.18, $pT_{\beta 1}$= 0.01; R^2 GMHR= 0.37, $pT_{\beta 2}$= 0.002). The model was described by MHR-RCVHR= 19.03 – 1.40*age + 13.08*GMHR (F= 9.87, p= 0.001). No statistically significant relationship was found based on change in MHR-RHR. **CONCLUSION**. The relatively long duration GOR exposures are typically used to determine cardiovascular +Gz tolerance in human-use centrifuge studies. Based on the variables examined in this retrospective study, there does not seem to be a significant effect of age on +Gz tolerance.